

The Kinetic Particularities of Anodic Dissolution of Cu-Au and Ag-Au Alloys at the Potentials of Monochloride Formation

- S. Grushevskaya, T. Kuznetcova, and A. Vvedenskii (Voronezh State University)

The alloys' selective dissolution (SD) is usually complicated by formation of phase layer of insoluble conjunctions on the surface. The film's nature, thickness, porosity and other characteristics are determined by electrode potential E , anion composition and pH of ambient. If one component of the alloy is a noble metal which is thermodynamically stable in the experiment's conditions the defined anodic current coincides with the partial dissolution current of more electronegative component. The last gives the possibility of quantitative investigation of SD kinetics complicated by salt or oxide formation.

In this work the anodic dissolution of polycrystalline Cu-Au and Ag-Au ($X_{Au}=0.1\text{--}30\text{ at.}\%$) alloys and pure Cu and Ag in acid water-chloride ambient ($CCl=0.1M$) at 298K is investigated. The methods of current transients and multi-cycle inverse voltammetry of the static and rotating disk electrodes including electrodes with a ring were used.

It has been established that after forming of the salt film the dissolution of Cu, Ag and their alloys with Au ($X_{Au}=4\text{--}30\text{ at.}\%$) is limited by mass transfer in phase of CuCl or AgCl but with an increase of E the value of current i rises. On $i-E(t)$ curve the amplitude and location of current peak which is responsible to monochloride's formation does not depend on X_{Au} . However when $X_{Au} > 4\text{ at.}\%$ the anodic process is controlled by interdiffusion of components in the alloy as their dissolution in active state. Now the alloys' dissolution is much more slow and peak potential is noticeably ennobled because of Cu or Ag surface concentration's diminishing. Thus the SD kinetics of Cu-Au and Ag-Au alloys with relatively high volume concentration of Au does not depend on

appearance or disappearance of insoluble salt film.

The initial stage of salt film formation on all electrodes is characterised by current maximum on $i-t$ curves. The peak is concerned with difficulties of monochloride's anodic crystallisation stage. As X_{Au} grows this maximum appears at higher E and its amplitude decreases. Accordance to copper the method of separation for the current density of phase formation from the total current has been elaborated. It has been found that CuCl anodic 2D-nucleation flows in regime of instant activation of potential centers of nuclei formation. The density of such centers drops with increasing of gold's concentration.